1. HARDWARE AND SOFTWARE OPTIONS

This section is an introduction to the terminal support options of the Synclavier (R) Digital Music System. In it, you will learn about

- the hardware required;
- the terminal keyboard;
- the interrelationship of the software modules;
- the care and handling of floppy diskettes;
- starting the system.

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HARDWARE

Computer

New England Digital's 16-bit ABLE computer comes as either part of your Synclavier (R) Digital Synthesizer or as a "stand-alone" unit. It will have between 32K and 60K words of memory, depending on the number of 8K or 32K memory boards installed. The system will work with only 32K words of memory, but additional memory will increase the size of the largest file or sequence that you can edit with your system.

Terminal

The terminal consists of a video display and an alphanumeric keyboard. In the Synclavier (R) system any of the following terminals can be used: ADM-3a, ADM-5, ADM-11, VT52, VT100, VT640, DQ640, Datamedia 1510, or Datamedia 1520. Other terminals may be used if they emulate one of these.

Floppy Diskette Drive System

Attached to the computer are either dual floppy diskette drives or a Winchester Disk with a single floppy diskette drive.

The dual floppy diskette drive system consists of a main or left-hand drive and an auxiliary or right-hand drive. The diskette drives come in two sizes: 5 1/4-inch and 8-inch.

The 5 1/4-inch minidiskette drive can be either single density or double density. Both single and double density can be used in the same system if the double density drive is used for the main drive. If the main drive is single density, the auxiliary drive must be single density as well.

The 5 1/4-inch minidiskette drives are enclosed in their own cases and attached to the computer back panel. They can also be used as remote drives attached to either a dual floppy diskette system or a Winchester Disk system (see below). Remote drives must be single density if the main drive is a 5 1/4-inch single density drive; otherwise they can be double density.

The 8-inch maxidiskette drives are available as single density only and are installed in the computer as main and auxiliary drives. They can also be used with 5 1/4-inch single or double density remote drives.

Winchester Disk Drive System

The Winchester Disk also comes in two sizes. The 5 1/4-inch Winchester is shipped and used in its own protective case and is connected to the computer back panel. The 8-inch Winchester is also shipped in its own protective case, but it is installed in the white cabinet and internally connected to the Digital Synthesizer before use. A D4567 Multiply/Divide Board, standard on all Synclavier (R) systems, is required for operation.

A single floppy diskette drive, either 5 1/4-inch or 8-inch, must be connected to the computer in order to use the Winchester Disk. A second floppy diskette drive is also handy for backup purposes in case of a Winchester breakdown. Also, you will find that floppy diskette drives are slightly more portable than Winchesters.

Tape Drive Subsystem

The Tape Drive Subsystem provides an efficient archive and backup for any system using a Winchester Disk drive. It comes in its own packaging and is connected to the computer back panel. It can be used with different sizes of cartridge tapes although the Scotch DC 300XL with 15 megabytes of storage capacity is recommended.

Printer

A printer produces permanent copies of SCRIPT compositions, timbre displays, displays from the sampling system, and music notation. Printers that work with the system include the DECwriter, LA-34, Printronix, PRISM80 and Diablo630. The D40 interface for connecting the printer to the Synclavier (R) computer is required.

NOTE: Instructions for connecting and/or installing floppy diskette drives, Winchesters, Tape Drives and Printers are in the Options Setup section of the "Synclavier (R) Setup Manual."

USING THE TERMINAL

The hardware component you need to be most familiar with is the terminal. The commands that direct the computer's operating system are typed at the terminal keyboard and the response appears on the terminal screen.

In Synclavier (R) systems, the terminal is used in the full duplex mode. That is, when you press a key, a code is transmitted to the computer, the computer sends the appropriate code back to the terminal, and the information is displayed on the terminal screen.

Some programs, such as the System Monitor programs, instantaneously "echo" most characters typed on the keyboard back to the terminal. These programs give the illusion that you are typing directly on the screen.

In others, such as the Synclavier (R) Real-Time Performance system, the computer pays no attention to input typed and the terminal appears dead.

Most terminal keyboards look like typewriters. They have a modified typewriter keyboard and either a system for printing on paper or a terminal screen called a CRT (for cathode ray tube).

When typing input on a terminal, you'll see a small white or green square called the cursor on the screen. The cursor appears where the next printing character you type will appear on the screen.

Special Keys on the Terminal Keyboard

The terminal keyboard resembles a regular typewriter keyboard. You type on it just as you would on a typewriter. There are, however, some special keys designed to modify the action of other keys or to transmit special control information to the computer.

RETURN

When using the System Monitor program (see below), you complete every command or line of text by pressing the RETURN or CR key. This sends a signal to the computer that your instruction or line of text is complete. You will, in fact, get no response from the computer to anything you type until you press RETURN. The cursor will be returned to the beginning of the next line, somewhat like a carriage return on a typewriter.

CTRL

The CTRL, or control, key does not transmit information by itself. A "non-printing" character is transmitted to the computer when you hold down the CTRL key while pressing another key. (The convention for indicating this procedure is CTRL-X or CTRL-Y.) No corresponding text symbol is displayed on the screen. You will learn the specific uses of the CTRL key when you learn how to use software modules. Both the Screen Editor and Music Printing module; for example, use the CTRL key extensively.

DELETE or RUBOUT

Any mistakes that you make while typing commands can be easily corrected by pressing the DELETE or RUBOUT key to erase one letter at a time backwards from right to left. On the ADM-3A, you will press SHIFT-RUB.

SHIFT

You can type on most terminals in either upper or lower case, using the SHIFT key just as on a typewriter.

CAPSLOCK

The CAPSLOCK key found on many terminal keyboards (e.g., the VT100) is used to type only upper case letters. Other terminals (e.g., the ADM-3A) have a switch to transmit only upper case. To return to lower case, press CAPSLOCK again or reset the upper-lower case switch. (NOTE: On either terminal, number or symbol keys will not be affected by the CAPSLOCK or switch; they can only be accessed with the SHIFT key.)

LINEFEED

The LINEFEED key is used in the Monitor to scroll one line of text at a time onto the screen when listing a text file.

BREAK

The BREAK key has two separate functions. In the Monitor Program, it is used to break into a listing and bring back the Ready prompt. From all other software modules, the BREAK key is used to return to the Monitor. Both uses will be further explained in the following sections.

CURSOR CONTROL

The cursor control keys are the four keys marked by arrows that move the cursor in the direction indicated by the arrow. They are used primarily in the Screen Editor and Music Printing modules.

KEYPAD

Most terminals have, to the right of the regular keyboard, an additional set of keys called the keypad. This includes the numerals 0 to 9, a period, a comma and a dash, along with an ENTER or RETURN key. The keypad is used extensively in the Music Printing Option.

PF Keys

Some terminals, such as the VT100, have four keys located above the keypad labeled PF1, PF2, PF3 and PF4. PF keys activate software modules from other software modules.

SET UP key

The SET UP key is used as part of the terminal initialization procedure as described in the "Synclavier (R) Setup and Installation Manual." It is also used with the 0 key (SET UP-0) to clear the screen without affecting anything in computer memory.

Keys to Avoid

CTRL-S and CTRL-Q

Avoid pressing the CTRL and S keys at the same time (CTRL-S). Doing so will "freeze" your screen. If you do freeze it accidentally, unfreeze it by pressing the CTRL and Q keys simultaneously (CTRL-Q).

NOSCROLL

The NOSCROLL key on the VT100 and the VT640 will also freeze the display on your screen. That is, the computer will stop printing characters on the screen and receiving characters from the keyboard until you press NOSCROLL again. You should be especially careful not to press NOSCROLL accidentally. If you do press NOSCROLL in the wrong sequence with other keys, the system may refuse to respond to all keyboard commands.

SOFTWARE

System and User Software

There are two types of software for Synclavier (R): system and user. The system software consists of the computer program, or operating system, which runs the Synclavier (R) system. It coordinates the input from the terminal keyboard or the Synclavier (R) keyboard unit and the output to the synthesizers, terminal display, or printer. The diskettes labeled "XPL System" and the one labeled "SCRIPT System" contain system software. The Winchester Bootload and Installation diskettes contain system software specific to the Winchester Disk.

User software holds the files and programs that you are working on, as well as various programs created here at New England Digital. The SCRIPT User Diskette, the MAX User Diskette, and the Utility Programs User Diskette all contain user software. Along with the program libraries, they have empty file space that you can use to store your own files. When you run out of file space on these user diskettes, you can purchase blank diskettes from New England Digital and prepare them for use by following the procedure outlined in the "Using the Utility Programs."

In the floppy diskette drive system, the system diskette will be placed in the left-hand, or main, drive and the user diskette will be placed in the right-hand, or auxiliary, drive. Winchester Disks contain both system and user software.

NOTE: All of your operating system software is configured here at the factory to match the memory size, drive system, terminal type and printer type of your system. If you are updating a system, perhaps by adding memory, changing terminals or adding a printer, you will have to reconfigure your system software using the CONFIGUR program outlined in the "Using the Utility Programs."

The three system diskettes (SCRIPT System, XPL System, and Winchester Bootload) are essential to system operation. You should make back-up copies of these three diskettes as soon as possible and put them away for future emergency use. Instructions for making copies of diskettes is in "Using the Utility Programs."

Software Modules

New England Digital has developed a series of software modules operated from the computer terminal. The figures at the end of this section show the interrelationships of these modules. The following list briefly describes the modules and their uses. Detailed information is in the manuals referenced.

System Monitor

The System Monitor (also known as the Monitor or the Monitor Program), is the central piece of software, or "front-end" of the system software modules. The Monitor is placed into the computer's memory when you press the LOAD button on the computer. The Ready prompt that appears on your terminal screen signifies that the Monitor is ready to interpret commands typed in at the terminal.

Each system diskette (the XPL System diskette and the SCRIPT System diskette) contains a copy of the Monitor Program plus resource modules. The XPL System diskette contains, in addition to the Monitor Program, the Scientific XPL language and certain files required for XPL programs (such as the MAX libraries and the Signal File Manager). The SCRIPT System diskette contains the SCRIPT and Real-Time software in addition to the Monitor. It also allows you to access the Music Printing software stored on a special SCRIPT user diskette.

Thus, when the Monitor is loaded from a SCRIPT system diskette, you can

- play the Synclavier (R) keyboard unit or guitar interface;
- use the SCRIPT software to compose music;
- access the Screen Editor to edit your SCRIPT sequences;
- use the Music Printing module to print out scores.

On the other hand, when the Monitor is loaded from an XPL system diskette, you can

- run and compile XPL programs that you have created;
- access the Screen Editor to edit text files;
- coordinate the operation of the MAX libraries.

Finally, when the Monitor is loaded from the Winchester Disk, you can do all these things because the Winchester contains all software modules.

Screen Editor

The Screen Editor, another "front-end" module, provides a complete set of commands for changing and manipulating text files directly on the terminal screen. You can use it to create and edit text documents, SCRIPT compositions, MAX and Scientific XPL programs. It includes facilities for global changes, line copying, error recovery, word processing, and language rule checking. Instructions are in "Using the Screen Editor."

NOTE: The Screen Editor described in this manual is only on those SCRIPT or XPL diskettes with "Advanced Screen Editor" on the label.

SCRIPT

The SCRIPT software modules make up a musical notation system that gives you the flexibility of composing either at the Synclavier (R) keyboard unit or at the computer terminal. At the terminal, you can create a musical sequence by typing in commands that give the computer precise instructions regarding the pitch and rhythm of each note as well as the volume, dynamics, and other aspects.

Included in the software is the SCRIPT Compiler which converts the alphanumeric music notation into a Real-Time Synclavier (R) performance piece. Another SCRIPT program, the Reverse Compiler, converts a live Synclavier (R) keyboard or guitar performance into a SCRIPT composition for display on the computer terminal screen. You can access the SCRIPT software from either the Monitor Program or the Screen Editor.

Instructions (including tutorials) are in the "SCRIPT User Guide"; the "SCRIPT Reference Manual" provides more concise instructions for quick reference.

The following two modules are accessed with Monitor commands from the SCRIPT system diskette.

Real-Time Performance

You are already familiar with the Real-Time Performance module which directs the operation of the Synclavier (R) keyboard unit and optional guitar interface. This software is linked with the System Monitor and the SCRIPT software to form an integrated software package. When the SCRIPT system diskette is placed in the main or left-hand drive, the Monitor command PLAY, entered at the terminal keyboard, transfers control to the keyboard unit or guitar option.

Instructions for using the Real-Time Performance system are found in the Synclavier (R) Instruction Manual.

Music Printing

The Music Printing software is also linked with the System Monitor and SCRIPT software to form an integrated unit. With this module, compositions written in SCRIPT notation can be translated into standard music notation. You can also transcribe the music you have performed on the Synclavier (R) keyboard unit or guitar interface. Special editing commands allow you either to change notes or modify the way they are transcribed.

Music Printing is introduced in the "Music Printing User Guide," with complete instructions in the "Music Printing Reference Guide."

Scientific XPL

The Scientific XPL language is used to create real-time programs for ABLE computers. It combines the convenience of a high-level language with the capacity for high speed data collection, bit manipulation and logical expression processing. The XPL software module consists of a three-pass optimizing compiler and a run-time library file.

Several revisions of the Scientific XPL language have been developed over the years. The standard version now is the fourth revision designated "XPL/4." A fifth revision, "XPL/5," has been completed and is optionally available. The differences between these two versions are important only if you are involved in special software development.

Basic instructions for creating files using the Scientific XPL Language are in the section, "Using the Monitor." More detailed programming information is in the Scientific XPL Reference Manual available from New England Digital.

The following two modules go with the XPL software module.

MAX Language Library

The MAX Language Library contains special Scientific XPL procedures which enhance the Scientific XPL Language for musical applications. With MAX, you can develop your own customized digital synthesis system without being restricted to the Synclavier (R) Real-Time system. The MAX Library can be used for sophisticated music instructional drills, for example, or for the design of custom interfaces with film and video equipment. The MAX Language software is provided on one or several user diskettes which work in conjunction with some system files on your XPL System diskette. Instructions are in the "MAX User Guide" and in the "MAX Reference Manual."

Utility Programs

The Utility Programs are for copying files, formatting blank user diskettes, customizing system diskettes, and so on. The programs are stored on a user diskette in the dual floppy diskette drive system, although, if you have 8-inch floppy diskettes, you will probably want to store any frequently used Utility Program on the extra space on the XPL System diskette. All the Utility Programs can be stored easily on the Winchester Disk. Instructions are in "Using the Utility Programs."

Signal File Manager

The Signal File Manager is the major software module in the Sample-to-Disk (TM) system available to users with a Winchester Drive. In this system, an analog waveform signal fed into the system can be converted into digital "samples." These samples are then stored on the Winchester Disk from which they can be recalled for display on the terminal screen or manipulation and performance through a special version of the Real-Time system. The Signal File Manager is the software that controls this process. Complete instructions are in The Sample-to-Disk (TM) Instruction Manual.

Another software module for the Sample-to-Disk (TM) system is the Analysis program. This software allows you to analyze changing harmonics in sampled sounds and to create Synclavier timbres that very closely reproduce acoustic sounds. With the Patch/Recorder program, part of this software, you can assign several different sampled sounds to different sections of the keyboard and, in this way, create a keyboard "patch" of sounds which you can play and record.

System Commands

You move from one software module to another by entering commands at the terminal keyboard. Some commands entered by typing the command word; others are entered by pressing a command key.

The following list summarizes the commmands. The first seven are typed commands; the remaining five are command keys.

SED	activates Screen Editor	from Monitor
PLAY	activates Real-Time system	from Monitor
.P	activates Real-Time system	from Screen Editor
PLOT	activates Music Printing	from Monitor
SFM	activates Signal File Manager	from Monitor
PATCH	activates Patch module	from SFM
.E	returns control to Monitor	from Screen Editor
BREAK	returns control to Monitor	from Real-Time system
	or Screen Editor	from Real-Time system
		from Reverse Compiler menu
		from Music Printing Main Menu
		from SFM
		from Analysis menu
PF1	activates Reverse Compiler	from Real-Time System
		from Music Printing Main Menu
		from Patch/Recorder menu
PF2	activates keyboard	from Music Printing Main Menu
		from Reverse Compiler
	activates Patch	from SFM
	activates RTP	from Analysis menu
PF3	activates Music Printing	from Real-Time system
		from Reverse Compiler
		from Patch/Recorder menu
PF4	activates SFM	from Patch/Recorder menu
		from Analysis menu

Modular Relationships

Figures 1 and 2 below show the relationships between modules for floppy diskette systems. When you load from an the XPL System Diskette you will be moving between the Monitor and the Screen Editor (Figure 1). Note that running a program, whether from the Monitor (using the RUN command or from the Screen Editor (using the .X command), returns you automatically to the Monitor.

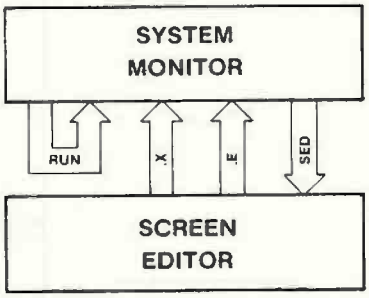

FIGURE 1

When you load from the SCRIPT System Diskette (Figure 2), you will be using the the Monitor and Screen Editor to create SCRIPT compositions and to use the Real-Time Performance system and Music Printing option. Note that when you press the BREAK key from Music Printing or from the Real-Time system, you will be returned to either the Monitor or Screen Editor depending on whether you were in the Monitor or Screen Editor prior to entering these modules.

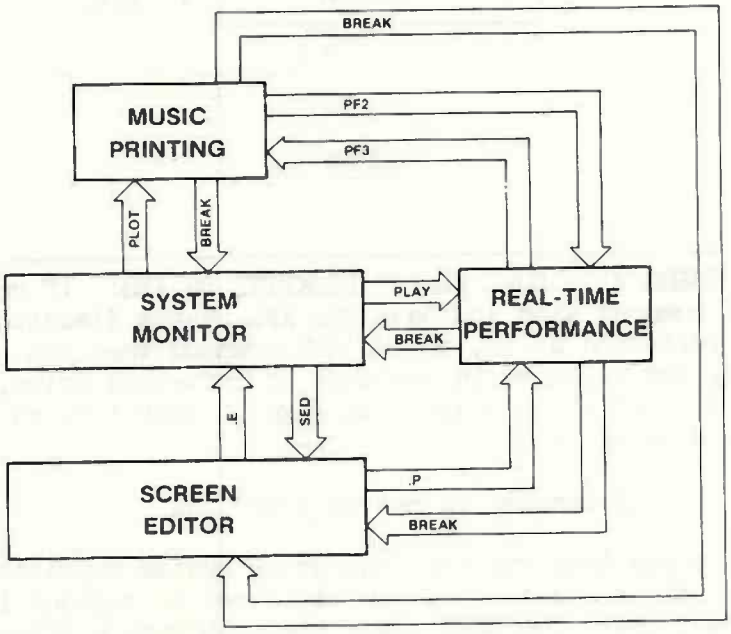

FIGURE 2

Figure 3 shows the modular interrelationships for systems with a Winchester Disk drive. If you have the Winchester Drive system, all system files necessary to access the modules are contained on the Winchester Disk. Note that in addition to the movement between the System Monitor and the Screen Editor, Real-Time Performance and Music Printing modules, the Signal File Manager can be accessed from the Winchester.

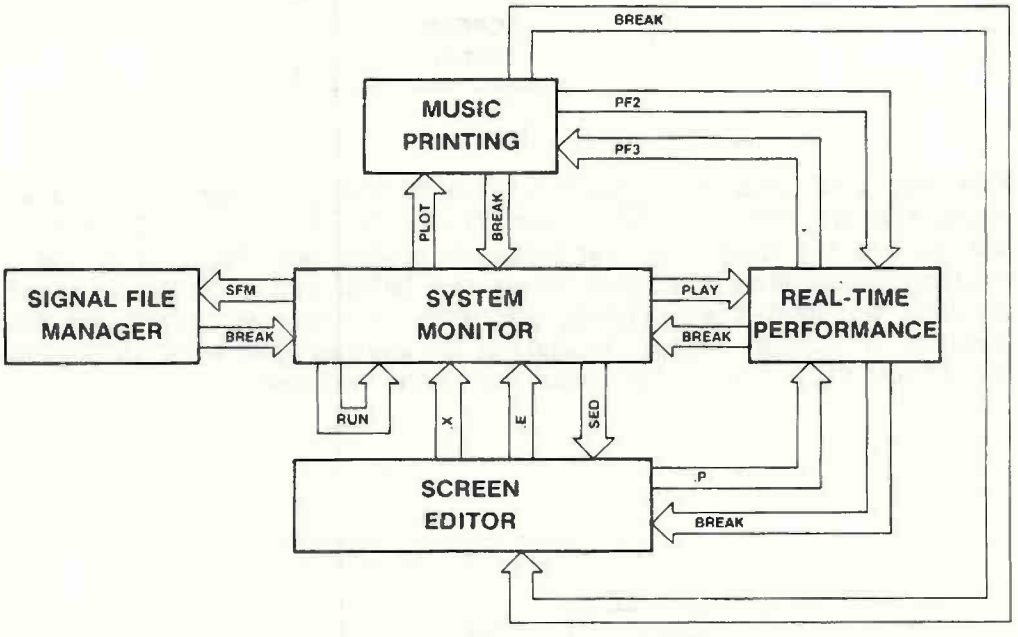

FIGURE 3

NOTE TO USERS WITH DUAL FLOPPY DISKETTE DRIVES: If you enter the PLAY command when you have the XPL System diskette in the main or left-hand drive, or the RUN command when you have the SCRIPT System diskette in the main or left-hand drive, your Monitor will print this error message on your terminal screen for each missing file:

System file <filename> is not on your disk

This tells you that you have the wrong system diskette in the main or left-hand drive and you will need to replace it with the correct one. You MUST press the LOAD button after changing system diskettes or YOU MAY LOSE SOME OF YOUR SYSTEM FILES.

CARE AND HANDLING OF FLOPPY DISKETTES

1. Always store your diskettes inside the protective jackets.

2. Store your diskettes at a temperature between 50 F and 125 F, preferably at room temperature.

3. Never expose diskettes to stray magnetic fields.

4. Never bend or otherwise physically abuse a diskette.

5. Never touch the exposed magnetic surface visible in the slot.

6. When inserting a diskette into the drive, hold it with the label up and the slot away from you. Be careful to insert it straight into the slot.

7. Always insert diskettes into the drive system after you turn the power on and remove diskettes from the drive system before you turn the power off.

8. When writing on the diskette labels, always use a felt tip pen, never a ballpoint or pencil.

STARTING THE SYSTEM

The first step in starting the system is to turn on the power of the different components of the system. These may be all connected to the same power switch or they may have separate switches. In the latter case, you will need to locate each switch and turn it on individually. The terminal switch, in particular, may be difficult to locate. It can be on the front or back, the top or bottom, or even under the terminal or on the wall. When you turn on the terminal, you will hear a "beep."

WARNING: Never insert any floppy diskette into the drive unit before the power is turned on. Data which is recorded on the diskette may be destroyed if it is inserted before the power is turned on.

Loading a Dual Floppy Diskette System

After the power to the system is turned on, take out an XPL System Diskette or a SCRIPT System Diskette and a formatted user diskette. (Formatting is explained in the "Using the Utility Programs.") Then follow these instructions.

1. Place the system diskette in the drive attached to the connector labeled MAIN DISK DRIVE on the back connector panel of the Synclavier (R) computer. This is called the left-hand drive or drive 0. Place the user diskette in the drive attached to the connector labeled AUXILIARY DISK DRIVE (called the right-hand drive or drive 1.)

   If you have the minidiskette drive system,

   a. Lift up the lock tab on the front of the drive.
   b. Slide the diskette into the slot.
   c. Push the lock tab down.

   If you have the maxidiskette drive system,

   a. Press the bar under the slot. The flap will pop open.
   b. Slide the diskette all the way into the drive.
   c. Push down the flap until it clicks and stays shut.

   In either case, the diskette should slide almost effortlessly into the drive and the tab or flap should shut easily. Any other condition indicates improper insertion.

2. Located either on the diskette drive or on the computer is a red LOAD button. Press it once and let go. The system will take a few seconds to "warm up." You'll hear the diskette drive motor start up and run for about ten seconds in a minisystem or about three seconds in a maxisystem.

When the system is ready, you will see on the terminal screen either one of the two following start-up messages:

N. E. D. ABLE Series System Monitor - 1 May 84

Synclavier (R)/SCRIPT System Monitor - 1 May 84

followed by the prompt message

Ready >

The Monitor program is now ready to accept a command or series of commands instructing the system what to do next.

NOTE: When you change system diskettes on your dual diskette drive system, you MUST press the LOAD button to place the new System Monitor into memory and make the software modules from the new diskette available to the system. IF YOU FAIL TO DO THIS, YOU MAY CORRUPT YOUR SYSTEM DISKETTE.

Loading the Winchester System

Once the power to all components in the system is turned on, take out the Winchester Bootload Diskette and follow these instructions.

1. Insert the Winchester Bootload Diskette into the drive attached to the connector labeled MAIN DISK DRIVE (drive 0). This diskette contains a program called the "Bootload Program" which loads the operating system from the Winchester Disk into the computer.

2. Locate the LOAD button on the main disk drive and press it once. The message

   Winchester Disk in "NOT READY" state

   will appear on the terminal screen and remain there until the Winchester Disk reaches rotation speed. When the system is ready, either one of the two following messages will appear on the terminal screen:

   N. E. D. ABLE Series System Monitor - 1 May 84

   Synclavier (R)/SCRIPT System Monitor - 1 May 84

   followed by the prompt message

   Ready >

   The Monitor program is now ready to accept a command or series of commands instructing the system what to do next.

Further Notes on Loading the System

If the terminal does not respond with the Ready prompt after loading, first check to see whether you have the correct System Diskette in the main drive. If it is the correct diskette, perhaps it has been corrupted by exposure to a stray magnetic field or is otherwise defective. If so call New England Digital for a replacement.

Normally you load the operating system just once during a session. However, occassionally it may become necessary to press the LOAD button and reload. For example, sometimes when you give the computer erroneous instructions which it cannot interpret, it stops. Pressing the LOAD button starts the system from the beginning again.